CBCS SCHEME

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18ME34

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024
Material Science

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define APF and Coordination number. Calculate the APF for HCP structure. **(08 Marks)**
b. Differentiate Edge dislocation and Screw dislocation. **(06 Marks)**
c. State and explain Fick's I and II law of diffusion. **(06 Marks)**

OR

2 a. List the Mechanical properties in Plastic range. Explain them briefly. **(08 Marks)**
b. With a neat sketch, explain the ductile to Brittle transition. **(06 Marks)**
c. With a neat sketch, explain the Plastic deformation by slip and twinning. **(06 Marks)**

Module-2

3 a. Differentiate between ductile and brittle fractures with sketches. **(07 Marks)**
b. What is Fatigue? What are the factors affecting the Fatigue life? **(05 Marks)**
c. What is Creep? Explain the Creep curve. **(08 Marks)**

OR

4 a. Draw the Iron carbon diagram and indicate the phase temperatures and explain the different phases in Iron carbon diagram. **(12 Marks)**
b. Define Homogeneous and Heterogenous nucleation. Obtain an expression for critical radius of nucleation. **(08 Marks)**

Module-3

5 a. What is Heat treatment? Explain the TTT diagram for Eutectoid steel. **(09 Marks)**
b. Differentiate between Annealing and Normalizing. **(05 Marks)**
c. Explain Martempering with neat sketch. **(06 Marks)**

OR

6 a. With a neat sketch, explain Nitriding process and write its applications. **(08 Marks)**
b. With a neat sketch, explain the Progressive flame hardening. **(06 Marks)**
c. Give the compositions and applications of Grey Cast Iron and Spheroidal Graphite Iron. **(06 Marks)**

Module-4

7 a. What are Composite Materials? What are the advantages , limitations and applications of Composite materials. **(08 Marks)**
b. Explain Metal Matrix Composites and Ceramic Matrix Composites. **(06 Marks)**
c. What is the role of : i) Matrix ii) Reinforcement. **(06 Marks)**

OR

8 a. Derive the rule of mixtures for the Modulus of elasticity of a fiber reinforce composite when a stress is applied along the axis of fibers. (08 Marks)

b. With a neat sketch, explain the Sheet Moulding Compound Process. (06 Marks)

c. Calculate the volume ratio of Aluminum and Boron in Aluminum - Boron composite which can have the Young's modulus of Aluminum , Boron and Iron are respectively 71 GPa , 440GPa and 210 GPa. (06 Marks)

Module-5

9 a. Define Ceramic. Explain briefly the types of Ceramics and its applications. (08 Marks)

b. Differentiate the Thermoplastics and Thermosetting Plastics. (06 Marks)

c. With a neat sketch, explain the Resin transfer moulding. (06 Marks)

OR

10 a. Explain the materials used as implants in Human body. (06 Marks)

b. Write a note on Piezo electrical material and its applications. (06 Marks)

c. Explain the use of Non Destructive Testing for Residual Life Assessment. (08 Marks)

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